Predictors of satisfaction and quality of life following post-mastectomy breast reconstruction

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Keywords: Cancer, oncology, breast cancer, breast reconstruction, quality of life, satisfaction and survivorship

Abstract

Objective: Breast reconstruction is associated with multiple psychological benefits. However, few studies have identified clinical and psychological factors associated with improved satisfaction and quality of life. This study examined factors which predict satisfaction with breast appearance, outcome satisfaction and quality of life following post-mastectomy breast reconstruction.

Methods: Women who underwent post-mastectomy breast reconstruction between 2010 and 2016 received a postal questionnaire consisting of: The BREAST-Q Patient Reported Outcomes Instrument, The European Organisation for Research and Treatment of Cancer QLQ-30 Questionnaire, The Patient and Observer Scar Assessment Scale and a series of Visual-Analogue Scales. One hundred and forty eight women completed the questionnaire, a 56% response rate.

Results: Hierarchical multiple regression analyses revealed psychosocial factors accounted for 75% of the variance in breast satisfaction, 68% for outcome satisfaction and 46% for quality of life. Psychosocial wellbeing emerged as a significant predictor of satisfaction with breast appearance (β=.322) and outcome satisfaction (β=.406). Deep inferior epigastric perforator flap (DIEP) patients reported greater satisfaction with breast appearance (β=.120) and outcome satisfaction (β=.167).

Conclusions: This study extends beyond limited research by distinguishing between satisfaction with breast appearance and outcome satisfaction. The study provides preliminary evidence for the role of psychosocial factors predicting key patient reported outcomes and demonstrates the importance of psychosocial wellbeing and reconstruction type. Healthcare providers could assess psychosocial wellbeing prior to reconstruction to support optimal recovery. Clinicians could also use the findings of this study to justify the use of DIEP over implant reconstructions.

Background

Globally, breast cancer is the most common malignancy among women [1]. In the United Kingdom and the United States the estimated lifetime risk of breast cancer is 1 in 8 [2], with over 40,000 new cases diagnosed in the United Kingdom [3], and over 230,000 in the United States each year [4]. Today, women with a history of breast cancer constitute the largest group of cancer survivors [5]. Improved survival rates have placed increased importance on promoting and supporting a high quality of life and optimal psychosocial adjustment among breast cancer survivors. The primary treatment for breast cancer is surgical, consisting of either a mastectomy or breast conservation surgery [5]. Despite the increasing use of breast conservation surgery, there has been a steady increase in the number of women electing to undergo mastectomy [6]. This may be partially attributed to the incorporation of reconstructive options into mainstream breast cancer surgery treatment. For many women a mastectomy can lead to a range of long-term psychosocial sequela [7], including anxiety and depression, as well as psychosexual changes including body image disturbance, loss of femininity and attractiveness, and decreased sexual desire and/or sexual pleasure [7-10].

Post-mastectomy options include using an external prosthesis, undergoing breast reconstruction surgery or deciding to have no prosthesis or reconstruction. An external prosthesis is an artificial breast form, moulded to imitate the natural shape of a woman's breast [11]. Many women have reported the use of an external prosthesis as somewhat inconvenient describing the prosthesis as difficult to keep in place, uncomfortable and limiting in terms of both clothing options and physical activity [8].Breast reconstruction may provide an effective solution to the problems associated with the use of an external prosthesis. Women undergo breast reconstruction for a variety of reasons; including the desire to improve body image [12], restore feelings of wholeness and body integrity [13], a reluctance to wear a limiting external prosthesis and the ability to wear a greater variety of clothing [14]. However, the decision to reconstruct the breast is complex and incorporates patient preference, treatment history, anticipated postoperative treatment and anatomy, specifically the size/shape of the breasts [15]. The primary goal of breast reconstruction is to obtain the best aesthetic outcome [16]. The surgeon in consultation with the patient must decide between the different methods of reconstruction (autologous tissue or implant or a combination of both) and the timing of reconstruction, which could be either during the same procedure as mastectomy (immediate) or at a later stage (delayed). In the United Kingdom, the National Institute of Clinical Excellence (NICE) recommends that breast reconstruction is offered to all women following mastectomy [17]. In England and Wales approximately 21% of women undergo breast reconstruction [18]. Internationally, breast-reconstruction rates vary; the United States report rates between 24.8%-59% [19, 20], and Australia and Denmark report rates of 9% and 14% respectively [21, 22].

For many women breast reconstruction is associated with psychological benefits including improved appearance satisfaction, re-established psychological wellbeing [23] and positive effects on body image and self-esteem [24]. Moreover, breast reconstruction may help to strengthen the affective and sexual relationship of couples [25]. Some studies suggest breast reconstruction is one of the most important determinants of long-term health and wellbeing

among breast cancer survivors [26]. These benefits have been observed for both immediate and delayed reconstructions [27] and across a number of procedures [26]. However, some studies have reported similar patient outcomes following breast reconstruction compared to breast conservation surgery or mastectomy alone [28], with one study reporting poorer psychosocial functioning and increased mood disturbance in patients who underwent reconstruction compared to mastectomy alone [27]. Complications with the reconstructed breast and abdominal problems have been identified as key causes of dissatisfaction with breast reconstruction [29]. The type of breast reconstruction may also influence patient satisfaction. For example, autologous tissue reconstruction (using a patient's own tissue to reconstruct the breast), involves scarring to the breast and donor-site and donor-site morbidity (complications at this site as it heals) [30]. Additionally, women may be required or choose to undergo additional surgery following the reconstruction, including nipple reconstruction, reshaping a flap, removing extra fat from a donor site, or repositioning the implant [31]. Yet, scarring as an area of potential dissatisfaction is neglected within current literature [32].

Restoration of psychological wellbeing is a key objective for postmastectomy women undergoing breast reconstruction. Therefore, patient satisfaction (which reflects the patient's assessment of the achievement of personal benefits of the procedure) is an important marker of surgical success in breast reconstruction, as the overall goal is to *satisfy* patients with respect to improvement in the appearance of their breasts and psychosocial functioning [33]. Patient satisfaction measures have been reported as a primary and useful source of feedback within healthcare services and many patients report high levels of satisfaction following breast reconstruction [34]. However, the value of distinguishing between satisfaction with the appearance of the breasts (e.g., size, shape and symmetry) and satisfaction with the overall outcome (e.g., overall evaluation of surgery, expectations and decision regret) is under-recognised within the field of psycho-oncology. Moreover, a central rationale in the majority of healthcare interventions is the improvement in one or more aspects of a patient's quality of life, and contemporary literature indicates improved quality of life following posy-mastectomy breast reconstruction [33].

Beyond the evidence that breast reconstruction may be positively associated with satisfaction and improved quality of life, few studies have attempted to identify the key factors that are involved in determining levels of reported satisfaction and quality of life. For example, one study reported 93% of women were satisfied with their breast reconstruction, but the reasons for their satisfaction were not explored [35]. Yet, satisfaction is often based on a range of factors, although few studies distinguish between breast satisfaction and outcome satisfaction. The primary aim of this study was to identify the factors which predict satisfaction with breast appearance in a group of patients who had undergone post-mastectomy breast reconstruction. The secondary aim was to identify whether the same or different factors predict outcome satisfaction and global quality of life.

Methods

Design

The present study utilised a cross sectional retrospective questionnaire design, which examined predictors of satisfaction with breast appearance, outcome satisfaction and global quality of life following post-mastectomy breast reconstruction.

Procedure and participants

Ethical approval was granted by a university ethics committee and a local NHS trust committee. Study eligibility criteria consisted of women aged 18 and over, who had elected to undergo breast reconstruction following breast cancer, with no breast cancer recurrence or palliative treatment. Eligible participants were identified from patient lists of two Consultant Plastic Surgeons based in one teaching hospital. In total 263 women were identified as eligible. A postal questionnaire was administered to all eligible women, along with information regarding the purpose of the study, a consent form, an opt-out slip, and instructions on how to complete the questionnaire and two stamped addressed envelopes for the return of the questionnaire and consent form /opt-out slip. Two weeks after the initial postal administration 71 women had responded. A further 192 second questionnaires and reminder letters were sent to those women who had not yet responded. One hundred and forty eight responders completed and returned the questionnaire (a response rate of 56%). Responders were asked to provide consent to the release of their demographic details and relevant sections of their medical notes. Demographic and clinical characteristics of the sample are displayed in Table 1. Nine women did not provide consent for their details to be released. The mean age of participants was 55 years (*SD*=8.70), with women aged between 32-76 years old and 84% of participants were White-British.

Measures

The Breast-Q Scale (reconstruction model): a validated patient-report outcome questionnaire, which evaluates outcomes among women after breast reconstruction. The scale comprised 57 items divided into five modules: (1) satisfaction with breasts, (2) satisfaction with outcome, (3) psychosocial wellbeing (4) sexual wellbeing and (5) physical wellbeing. The validity and reliability of the Breast-Q has been established within this patient population [36]. The measure used a 4 point scale ranging from 1 (very dissatisfied/disagree/none of the time) to 4 (very satisfied/agree/all of the time). Scores were transformed using Q-Score scoring software (Q-Score^{TM} Version 1.0) to provide a total score ranging from 0-100. Higher scores indicated greater satisfaction or quality of life.

The European Organisation for Research and Treatment of Cancer (EORTC QLQ-30) measure: a 30 item standardised, self-administered measure which assessed health related quality of life of cancer patients. The scale comprised five functional scales (physical, role, cognitive, emotional and social), three symptom scales (fatigue, pain and nausea), a number of single items which assessed commonly reported symptoms of cancer patients (dyspnoea, loss of appetite, insomnia, constipation and diarrhoea) and the financial impact of the disease.

Items 1-28 ranged from: 1 (not at all) to 4 (very much). Items 29 and 30 are single items which assessed global health status and quality of life and ranged from 1 (very poor) to 7 (excellent). High scores on these items represented high global health status and quality of life. A linear transformation was used to standardise the raw scores, on a scale of 0–100. High scores on the functional scales indicated good functioning, although high scores on the symptom scales indicated a greater number of symptoms. The validity and reliability of this measure has been established [37].

Patient and Observer Scar Assessment Scale (POSAS): is a self-administered scale which measures scar quality from the patients' perspective. This 7 item measure utilised a 10-point scale, which ranged from 10 (worst imaginable scar or sensation) to 1 (as normal skin) on seven scar features including: pain, itching, colour, pliability, thickness, relief and overall scar quality. The validity and reliability of the POSAS measure has been established within this patient population [38]. A total score for each scar feature was obtained by reversing and summing the six specific scar items. Overall scar quality was scored separately, reversed and summed. A higher score indicated greater satisfaction with the scar features and overall scar quality.

A series of **Visual Analogue Scales (VAS)** were developed to examine the aesthetic features of breast in three dimensions: symmetry, shape and sensitivity. Each dimension utilised a 10cm horizontal VAS scale which ranged from 1 (complete satisfaction) to 10 (complete dissatisfaction). The scores from each dimension were reversed and summed to provide three total scores for symmetry, shape and sensitivity. A higher score indicated greater satisfaction with aesthetic features of breast.

Statistical analysis

Three hierarchical multiple regression analyses were performed for three dependent variables: satisfaction with breast appearance, outcome satisfaction and global quality of life. In the analysis, the appearance related visual analogue measures and the Breast Q measure ("satisfaction with breasts") were entered at stage one. The POSAS scarring variables were entered at stage two and a variable from the Breast Q measure ("satisfaction with outcome") was entered at stage three. In the final stage of the model EORTC quality of life variable ("global quality of life") and the Breast Q measures ("psychosocial wellbeing and sexual wellbeing") were entered. A moderator analysis was performed to determine if participants' age, date of reconstruction or type of reconstruction moderated the dependent variables.

Results

Preliminary analyses were performed to test the assumption of normality and multicollinearity. The analyses suggested there was no violation of normality. Histograms were symmetrical and approximately bell-shaped, indicating normal distribution. The normal probability plots also indicated that the residuals were normally distributed. Collinearity statistics guidelines state if the largest Variance Inflation Factor (VIF) is greater than 10 and if the average VIF is substantially greater than 1 the regression may be biased [39]. Tolerance < 0.2 also indicates a potential problem [39]. In the present study, the analyses did not meet

any of the criteria, suggesting multicollinearity was not present. Three separate hierarchical multiple regression analyses were performed:

Satisfaction with breast appearance

Hierarchical multiple regression analysis revealed that at stage one, appearance variables contributed significantly to the regression model, (F (6, 98) = 23.87, p< .001) and accounted for 59% of the variation in satisfaction with breast appearance. The scarring variables explained an additional 8% of variation in satisfaction with breast appearance and this change in R^2 was significant, (F (7, 91) =3. 12, p=.005). Introducing the variable outcome satisfaction to the regression model explained an additional 10% of the variation in satisfaction with breast appearance and this change in R^2 was significant, (F (1, 90) = 9.57, p=003). Finally, the addition of quality of life measures (psychosocial wellbeing, sexual wellbeing and global quality of life) to the regression model explained an additional 4% of the variation in Satisfaction and this change in R^2 square was significant, (F (3, 87) = 4.71, p=.004). The final model accounted for 75% of variance in satisfaction with breast appearance (F(17, 87)= 14.96, p=<.001, R^2 = .745, R^2_{Adjusted} = .695 **(Table 2: Accessible online via supplementary material).** In the final model psychosocial wellbeing was found to be the most important predictor variable of satisfaction with breast appearance (β =*.322, p=.006).* Moderator analysis also demonstrated participant age (β=.011, p=.865) did not significantly moderate breast satisfaction. However, there was a trend between breast satisfaction and type of reconstruction (β=.120, p=.073), with higher levels of satisfaction of breast appearance demonstrated with Deep Inferior Epigastric Perforator Flap (DIEP) reconstruction compared to other types of reconstruction. The date of reconstruction (β=.148, p=.029) significantly moderated satisfaction with breast appearance. A one year increase in the date of reconstruction between 2010 and 2016 resulted in a .148 increase in breast satisfaction.

Outcome satisfaction

Hierarchical multiple regression analysis revealed that at stage one, appearance variables contributed significantly to the regression model, (F (7, 97) = 16.75, p< .001) and accounted for 55% of the variation in outcome satisfaction. Introducing the scarring variables explained an additional 6% of variation in satisfaction with breast reconstruction outcome and this change in R^2 was significant, (F (7, 90) = 2.05, p=.057). The addition of quality of life measures (psychosocial wellbeing, sexual wellbeing and global quality of life) to the regression model explained an additional 7% of the variation in satisfaction and this change in R^2 square was significant, (F (3, 87) = 5.99, p=.001). The final model accounted for 67.7% of variance of outcome satisfaction (F(17, 87)= 10.71, p=<.001, R^2 = .677, R^2_{Adjusted} = .613 **(Table 3: Accessible online via supplementary material)**. The factors found to be the most important predictors of outcome satisfaction were breast sensitivity (β= -.169, p=.014), pain (β= -.204, p=.018), scar thickness (β=.369,p=041) and psychosocial wellbeing (β=.406, p=.002). Moderator analysis demonstrated participant age (β= -.018,p=.804) and date of reconstruction (β=.005, p=.950) did not significantly moderate outcome satisfaction, although type of reconstruction did significantly moderate outcome satisfaction (β=.167,p=.026), with

significantly higher levels of outcome satisfaction demonstrated with DIEP reconstruction compared to other types of reconstruction.

Global quality of life

Hierarchical multiple regression analysis revealed that at stage one, appearance variables contributed significantly to the regression model, (F (7, 97) = 5.85, p< .001) and accounted for 30% of the variation in global quality of life. Introducing the scarring variables explained an additional 11% of variation in global quality of life and this change in R^2 was significant, (F (7, 90) = 2.29, p=.034). Adding the variable satisfaction of the overall outcome explained an additional 0.6% of the variation in global quality of life and this change in R^2 was non-significant, (F (1, 89) = .950, p= .332). The addition of quality of life measures (psychosocial wellbeing, sexual wellbeing and global quality of life) to the regression model explained an additional 5.3% of the variation in global quality of life and this change in R^2 square was also significant, (F (17, 87) = 4.25, p= .017). Together all independent variables accounted for 46% of variance in global quality of life (F (23, 81) = 4.40, p=<.001, R^2 = .46.2, R^2_{Adjusted} = .357 **(Table 4: Accessible online via supplementary material)**. In the final model no one variable was found to be a significantly more important predictor of quality of life than another. Moderator analysis demonstrated participant age (β=.004, p=.962), type of reconstruction (β=-087, p=.371) and date of reconstruction (β=-730, p=.467) did not significantly moderate global quality of life.

Discussion

This study identified psychosocial factors which predicted satisfaction with breast appearance, outcome satisfaction and global quality of life following post-mastectomy breast reconstruction. The results of the hierarchical multiple regression analyses revealed individual psychosocial factors were able to predict a high percentage of the total variance for both satisfaction with breast appearance and outcome satisfaction, approximately 75% and 68% respectively. The total variance explained by the model for quality of life was more modest (46%). Moreover, psychosocial wellbeing was a key predictor of both satisfaction with breast appearance and outcome satisfaction. Previous literature also indicates aesthetic satisfaction promotes greater psychological wellbeing [12]. This study demonstrated women with greater psychological wellbeing are more likely to report greater satisfaction with breast appearance and outcome satisfaction. In line with previous research, we suggest the possibility of a relationship, whereby satisfaction with breast appearance promotes greater psychosocial wellbeing and greater psychosocial wellbeing promotes breast and outcome satisfaction. This finding has important clinical implications and demonstrates a need to consider the pre-existing psychosocial wellbeing of patients prior to breast reconstruction, in order to enhance optimal post-mastectomy outcomes. Moderator analysis demonstrated the date of reconstruction significantly predicted satisfaction of breast appearance. As the date of reconstruction increased satisfaction with breast appearance increased, this finding could be attributed to the continuously advancing reconstructive techniques offered. However, we must also consider if women are less satisfied with earlier reconstructive procedures due to

the time lag between use of services and evaluation of satisfaction, this may indicate satisfaction with reconstruction decreases overtime.

Unexpectedly as breast sensitivity increased, outcome satisfaction decreased. Breast sensitivity as a predictor of satisfaction has not been explored fully within current literature and warrants further consideration in future studies. Expectedly, as scarring pain increased outcome satisfaction decreased. Moreover, as scar thickness increased, satisfaction with the overall outcome increased. We speculate that some participants may have struggled to provide a precise scar thickness score. Although, these findings are inconsistent with previous qualitative scarring literature [32] they are undoubtedly of interest and warrant further consideration. Moreover, reconstruction type was associated with outcome satisfaction. DIEP patients reported greater satisfaction with the overall outcome compared to other types of reconstruction. Previous literature has reported higher satisfaction rates with autologous tissue based procedures than implant based reconstructions [26]. However, although greater patient satisfaction and cosmetic outcome is observed with the DIEP flap technique compared to other surgical procedures, there is no difference in reported quality of life [40]. This is consistent with the finding of the present study and suggests that procedure type effects both breast and outcome satisfaction but not overall quality of life. It may be that DIEP reconstruction enables women to perceive their reconstructed breasts, as a natural part of their own body which is not the case in implant reconstruction [7].

Strengths and Limitations

The present study sought to control for many of the shortcomings identified in previous literature [34]. Consequently, all outcomes were clearly defined and distinguished, standardised measures were validated within the same clinical population, the effect of scarring was considered and a multiple surgeon design was applied. Nevertheless, selection bias is possible as participants were identified by two Plastic Surgeons from one NHS site. Other limitations include the omission of pre-surgical data and the cross-sectional study design, which does not distinguish the direction of the relationships or account for the changing nature of the outcomes over time. As satisfaction is thought to fluctuate during long-term survivorship this limitation may be of particular importance. Additionally, some clinical characteristics could not be ascertained including other treatment types, the number of reconstructive surgeries and any reconstructive complications. Moreover, only a small sample of women elected for delayed reconstruction, therefore we were unable to examine if the timing of reconstruction moderated the dependent outcomes. Future studies should be prospective, longitudinal and possibly of a qualitative nature in order to provide a comprehensive understanding of the trajectory of satisfaction and quality of life following post-mastectomy breast reconstruction.

Clinical Implications

This study breaks down the concept of satisfaction and distinguishes between satisfaction with breast appearance and outcome satisfaction in order to provide preliminary evidence for key predictors of individual components of satisfaction. The findings of this study could be

used to inform women of the key predictors of satisfaction and quality of life as identified by this model. This will enable women to identify specific areas of focus and highlight areas which may require further surgical or psychological support in order to enhance their overall satisfaction and quality of life. Healthcare providers could also seek to assess patient's existing psychosocial wellbeing prior to reconstruction to support optimal recovery and post-reconstruction outcomes. Moreover, clinicians may also consider using the findings of this study to justify the use of extensive and complex DIEP reconstructions over implant reconstructions, despite the substantially higher monetary cost of the procedure.

Conflict of Interest: The authors declare that they have no conflict of interest.

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